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[Technical Note]

Harvesting and Processing Zooplankton for Use as Supplemental Channel Catfish Fry Feed

CHARLES C. MISCHKE* AND DAVID J. WISE

Mississippi State University, Thad Cochran National Warmwater Aquaculture Center, Box 197, Stoneville, Mississippi 38776, USA

Abstract.—We present the methods that we used to capture and dry large zooplankton from ponds to feed to channel catfish *Ictalurus punctatus* fry. Using a submersible pump and canister filter, we were able to capture about 1.0 kg (wet weight; 200 g in terms of dry weight) of zooplankton from well-fertilized ponds over 24-h trapping periods. This was a practical method for obtaining the large zooplankton that catfish fry prefer. Fish culturists may be able to use this method to harvest zooplankton throughout the year and store dried zooplankton for the hatchery season. The drying process may also be useful for processing and storing small zooplankton for the culture of other species of fish. The cost was about US$200 for the submersible pump, $200 for the canister and filter, and $40 for the food dehydrator.

In catfish hatcheries, fry are typically held in troughs for 7–14 d after hatching and are fed commercially prepared dry diets until stocked into nursery ponds. Supplements, such as the cysts of brine shrimp *Artemia* spp. and meal from krill *Euphausia* spp., have been shown to increase the weight of channel catfish *Ictalurus punctatus* fry (Weirich et al. 2000). However, increasing demand and variable yearly harvests have increased the cost of *Artemia* cysts. Locally available food supplements, such as zooplankton, would be a more sustainable food source, because individual farmers could harvest zooplankton from their ponds and not have to purchase commercial supplements.

Based on zooplankton studies with other fish species, there may be an advantage to supplementing channel catfish fry diets with zooplankton during the trough stage. Capturing rotifers from ponds with a rotating drum filter proved to be an effective way to rear sunshine bass (female white bass *Morone chrysops* × male striped bass *M. saxatilis*) in tanks (Ludwig and Lochmann 2000). Skrzypczak et al. (1998) used a floating pump to transfer live zooplankton into net cages for use in percid fry culture. Unlike the fry of smaller fish species, catfish fry do not consume small zooplankton such as rotifers and copepod nauplii at the onset of exogenous feeding. Rather, they consume larger zooplankton, showing a preference for large cladocerans (Mischke et al. 2003a). These large taxonomic groups of zooplankton captured from fry ponds are of excellent nutritional value, meeting or exceeding all known nutritional requirements of channel catfish fry (Mischke et al. 2003b).

This paper presents the method that we used to capture large zooplankton from ponds for use as a live feed in laboratory studies as well as the drying methods we employed to preserve the zooplankton as a supplemental feed.

* Corresponding author: cmischke@drec.msstate.edu

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Methods

A canister filter (Model 2-C; PurFlo, Round Lake Beach, Illinois; diameter = 22 cm, height = 60 cm, surface area = 4.4 m^2) equipped with a 100-μm polyester screen was attached to a 110-V, 373-W (½-hp), 238-L/min submersible pump (Ecosub 420; Leader Pumps, Bientina, Italy; Figure 1). The pump was connected to the canister with 1.5 m of 3.8-cm-diameter tubing. The pump was placed 0.5 m below the water surface in selected ponds. The system was allowed to filter pond water for 24 h before zooplankton were harvested from it. After filtration, the unit was rinsed thoroughly into a stainless steel tub. The rinsed filtrate was then washed through a 1,000-μm screen to remove any large insects. At this point, the live zooplankton could be transferred in aerated buckets for use in live-feeding studies.

When the zooplankton were dried for later use, the water and zooplankton were separated by pouring the filtrate into a 100-μm mesh bag. Gentle squeezing of the bag helped force the water through the mesh. Once most of the water had been removed, the zooplankton were spread thinly onto sheets of 100-μm screen cut to fit into a commercially available food dehydrator. The zooplankton were left to dry in the food dehydrator for approximately 12 h, at which time the dried sheets of zooplankton were removed from the screen and forced through sieves of the desired size. For channel catfish, we used sieves with an 800-μm mesh size. After sieving, the zooplankton has a consistency similar to fine sand. The final product was then placed in plastic bags and frozen until needed.

FIGURE 1.—Canister and 100-μm screen filter apparatus used to filter live zooplankton from pond water.

Results and Discussion

When a 100-μm screen was used, most small zooplankton and algae passed through the screen and were not retained by the filters. Sampling has been conducted year-round; copepods and cladocerans made up 90% or more of the sample counts. Relative abundance changed throughout the year, but adult copepods were always the most abundant zooplankton group in the samples. The largest proportion of cladocerans was captured in the late winter and early spring months (January–April). In ponds with dense zooplankton blooms, 24 h appeared to be the maximum time to allow for zooplankton capture because the filters began to clog after that amount of time. Graves and Morrow (1988) reported clogging and overflow after 6 h with their basket system for harvesting zooplankton. Using the pleated canister filter with a larger surface area allowed us to filter for a full 24 h without causing significant clogging of the filter and subsequent back-pressure on the pump. As the filter became full in ponds with dense zooplankton, the flow rate was reduced within the 24-h period, but not enough to cause the pumps to overheat. Also, during hot weather, fouling began to occur with longer filtration times; the filters smelled rancid from the death and subsequent decomposition of captured zooplankton.

The system of Graves and Morrow (1988) was specifically designed to capture live, undamaged zooplankton for hatchery use. Although our system can be used to harvest large quantities of live zooplankton, many of the zooplankton are damaged by it. The extent of damage and mortality by our system to the zooplankton was variable, but increased with temperature and density of captured zooplankton.

The amount of dried zooplankton varied according the zooplankton population present in the sampled ponds. In well-fertilized ponds, about 1.0 kg (wet weight) of zooplankton could be harvested from each canister every 24 h. This is equal to about 200 g when dried.

Using commercially available food dehydrators to dry locally captured zooplankton may be an inexpensive, sustainable way to supplement the diet of channel catfish fry. It is not known at this time how the drying process affects the quality of zooplankton relative to live zooplankton or the shelf-life of the dried zooplankton. However, after drying, the zooplankton smells like commercial diets; there is no rancid smell suggesting oxidation. Also, preliminary studies in our laboratory showed that the dried zooplankton mixed at a rate of 50% by volume with commercially prepared diets increased channel catfish fry growth 40–50% in 20 d (C. Mischke and D. Wise, unpublished data). Additional studies need to be conducted to determine the minimum amount of zooplankton supplementation required to elicit the improved growth response.

For research purposes, this is a practical method for obtaining the large zooplankton (either to feed live or dried) that catfish fry prefer. It may be more convenient for fish culturists to harvest zooplankton throughout the year and store dried zooplankton for the hatchery season. The drying process may also be useful for processing and storing the small zooplankton for the culture of other species of fish. Additional studies need to determine the affect of the drying process and subsequent storage on feed quality.

The cost of our system is about US$200 for the submersible pump, $200 for the canister and filter, and about $40 for the food dehydrator. The canisters should last indefinitely; the filters and pumps appear to last about 3 years with continuous use.

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